

ACCESSION #: 9908050162

NON-PUBLIC?: N

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Susquehanna Steam Electric Station-Unit 1 PAGE: 1 OF 4

DOCKET NUMBER: 05000387

TITLE: Reactor Scram

EVENT DATE: 07/01/99 LER #: 99-003-00 REPORT DATE: 08/02/99

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(ii)

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Cornelius T. Coddington Senior Engineer TELEPHONE: (610) 774-4019

- Nuclear Licensing

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: SB COMPONENT: ISV MANUFACTURER: A585

REPORTABLE EPIX: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On July 1, 1999, at 0208 hours with Unit 1 in Mode 1 (Power Operation) at 100 percent power, the neutron monitoring system received a high neutron flux upscale trip, which caused a reactor SCRAM. The inadvertent closing of the "C" outboard Main Steamline Isolation Valve thus isolating one main steamline caused the high neutron flux. The other three steamlines experienced high flow that caused all MSIVs to isolate. As a result of the

SCRAM, water level dropped to approximately -46 inches. Reactor water level was restored by using the High Pressure Coolant Injection (HPCI) System (auto-initiated) and the Reactor Core Isolation Cooling (RCIC) System. Reactor pressure peaked at 1048 psig and was controlled by cycling the Safety Relief Valves (SRVs). All SRVs re-seated after use. There were no diesel starts or challenges to the containment associated with this event. During this event, the "C" outboard MSIV exhibited excessive leakage, thus causing the total maximum leakage pathway Technical Specifications limit for the main steamline penetrations to be exceeded. The minimum leakage pathway for these penetrations remained below the analyzed limit. The inadvertent closing of the "C" outboard MSIV was caused by a stem-poppet separation. The cause of the "C" outboard MSIV stem to poppet failure was due to loss of pre-load on the stop plate bolting. The loss of the pre-load was due to actual clearances being less than the design tolerances, insufficient detail for assembling the stop plate to poppet connection, and inadequate torquing values for the stop plate bolting. Corrective actions that were completed include (1) the "C" outboard MSIV was repaired, (2) three additional MSIVs were inspected and reworked, and (3) the appropriate maintenance procedures were revised to include the new torquing criteria. Corrective actions remaining to be completed include (1) revisions to appropriate procedure to include revised inspection and torquing criteria, (2) inspection of similar Unit 1 MSIVs, (3) inspection of similar Unit 2 MSIVs, and (4) evaluation of potential solutions for MSIV leakage failures with a recommended course of action for improving MSIV performance. Since the plant performed as expected during this event and the total minimum pathway leakage from the main steam line penetrations was below the analyzed limit, there were no safety consequences or compromises to public health and safety.

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#### EVENT DESCRIPTION

On July 1, 1999, at 0208 hours, with Unit 1 in Mode 1 (Power Operation) at 100 percent power, the neutron monitoring system (EIIIS Code: 1) received a high neutron flux upscale trip, which caused a Reactor SCRAM. The high neutron flux was caused by the closing of the "C" outboard Main Steamline Isolation Valve (MSIV; EIIIS Code: BD), thus isolating one main steamline. The other three main steamlines experienced high flow that caused all MSIVs to isolate. As a result of the SCRAM, water level dropped to approximately -46 inches. Reactor water level was restored by using the High Pressure

Coolant Injection (HPCI) System (auto-initiated) and the Reactor Core Isolation Cooling (RCIC) System. Reactor pressure peaked at 1048 psig and was controlled by cycling the Safety Relief Valves (SRVs). All SRVs re-seated after use. Following the initial event, the required one hour ENS notification for the HPCI injection was made approximately two hours after the required notification time. Additionally, the "C" outboard MSIV exhibited excessive leakage, thus causing the total maximum leakage pathway Technical Specifications limit for the main steamline penetrations to be exceeded. The minimum leakage pathway for these penetrations remained below the analyzed limit. There were no diesel starts or challenges to the containment associated with this event.

#### CAUSE OF EVENT

The "C" outboard MSIV experienced a stem to poppet (disc) separation failure. The stem to poppet connection failed, allowing the poppet to travel into the valve body seat due to gravity and steam flow. The orientation of the valve allowed the separated poppet to isolate steam flow from the reactor, stopping flow rapidly. Reactor pressure increased in response to the isolated steamline resulting in void collapse and increased reactivity in the core, causing a reactor SCRAM on high flux. Also, steam flow was diverted to the remaining three open lines causing high flow isolation of the MSIVs. The "C" outboard MSIV failed to fully close due to loose parts (stop plate stud, nuts and locktabs) being on the poppet below the stem and stop plate. The cause of the stem to poppet separation

failure was a result of the loss of pre-load on the stop plate bolting.

This resulted in vibration induced wear on the nut locking tabs. Tab wear proceeded to the point where the nuts were free to turn. Flow induced vibration of the valve internals then worked to loosen the nuts and studs to the point of failure of the bolted connection. Several factors were determined to be the root causes of the loss of pre-load that allowed the bolts to work loose. These are (1) the designed tight fit tolerances resulted in an interference when the stop plate and poppet dimensions approached or exceeded design limits, (2) the MSIV vendor did not provide sufficient detail as to the design and importance of properly assembling the stop plate to poppet connection, and (3) the vendor provided an inadequate torque value for the stop plate bolting.

#### REPORTABILITY/ANALYSIS

This event (reactor SCRAM) was reported within four hours as required by 10CFR50.72(b)(2)(ii). This report is being written per 10CFR50.73(a)(2)(iv), in that the Reactor Protection System (RPS) was activated, constituting an Engineered Safeguard Feature (ESF) actuation along with the closure of the MSIVs on high flow. As previously noted, the plant responded to the high neutron flux trip and subsequent reactor SCRAM with MSIV closure as expected except for the "C" outboard MSIV. The analysis of the MSIV failure to fully close is discussed below. There was one ECCS (HPCI) initiation and injection. There were no emergency diesel generator starts. All the Safety Relief Valves that were manually lifted

to control reactor pressure during the event reseated. All required safety-related equipment was available throughout the event. Based on the

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above, there were no safety consequences or compromises to public health and safety as a result of this event.

The HPCI initiation and injection was an ECCS initiation and therefore, required a one-hour ENS Notification in accordance with

10CFR50.72(b)(1)(iv). The initial evaluation by control room personnel only identified that a four-hour ENS notification was required for the reactor SCRAM and ESF actuation. For the first hour, attention of control room personnel was focused on stabilizing the reactor and assessing the abnormality that caused the SCRAM. The need for the one-hour ENS notification was missed. Upon reviewing the Condition Report and ENS notification sheet prepared for the SCRAM, it was identified that the HPCI injection required a one-hour notification. The notification was made approximately two hours after the required notification time. Making the ENS notification late does not constitute an event that is, itself, reportable per 10CFR50.72 or 10CFR50.73.

The "C" outboard MSIV failure to fully close was determined to be reportable under 10CFR50.72(b)(2)(i), as a condition resulting in degraded barriers found while the reactor was shutdown, and 10CFR50.73(a)(2)(ii) in that the main steam line containment penetration leakage through both the inboard and outboard MSIVs was in excess of the total "as-found" maximum

pathway leakage Technical Specifications limit.

The MSIV leakage was found following the SCRAM when the "C" outboard MSIV failed to fully close. The maximum pathway leak rate through the valves would have been greater than the 300 SCFH Technical Specifications criteria. However, the leakage that would have actually reached the condenser (i.e., the minimum pathway leak rate) was 241 SCFH. This value is below the 300 SCFH analyzed for the condenser and in the dose calculations. As such, there were no safety consequences or compromises to public health and safety as a result of this event.

In accordance with the guidelines provided in NUREG-1022, Revision 1, Section 5.1.1, the required submission date for this report was determined to be August 2, 1999.

#### CORRECTIVE ACTION

The following corrective actions have been completed:

- o The "C" outboard MSIV was disassembled and repaired.
- o The "A" and "C" inboard MSIVs and the "A" outboard MSIV were disassembled, the stop plate/poppet assembly was inspected and reworked.
- o Evaluated potential generic impacts on remaining Unit 1 and Unit 2 MSIVs and concluded that these MSIVs remain operable.

The following corrective actions are to be completed:

- o Disassemble and inspect the stop plate/poppet assembly for the Unit 1 "B" and "D" inboard MSIV and the "D" outboard MSIV.

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- o Disassemble and inspect the stop plate/poppet assembly for the Unit 2

"A" and "C" inboard MSIV and the "B" outboard MSIV.

- o Revise the appropriate maintenance procedures to reflect the new inspection, fit-up and torque requirements to ensure increased reliability.

- o Evaluate possible solutions for MSIV leakage failures and recommend a course of action for improving MSIV performance.

#### ADDITIONAL INFORMATION

Past Similar Events: For the high neutron flux SCRAM:

None

For the exceeding of the MSIV Technical Specifications leakage limits:

LER 83-062-00, Docket No. 387/License No. NPF-14

LER 83-064-00, Docket No. 387/License No. NPF-14

LER 86-007-00, Docket No. 388/License No. NPF-22

LER 89-010-01, Docket No. 388/License No. NPF-22

LER 90-020-00, Docket No. 387/License No. NPF-14

LER 92-005-00, Docket No. 387/License No. NPF-14

LER 95-006-00, Docket No. 387/License No. NPF-14

LER 95-012-00, Docket No. 388/License No. NPF-22

LER 96-010-00, Docket No. 387/License No. NPF-14

LER 97-004-00, Docket No. 388/License No. NPF-22

LER 99-001-00, Docket No. 388.License No. NPF-22

Failed Component: MSIV HV-141F028C

Manufacturer: Atwood and Morrill Co., Inc.

Model: 21190-H

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